

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	109	macdonald-john-gavin.in.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/06/01 13:19
S2	2	quincy-roger-bradshaw.in.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/06/01 13:42
S15	16	(US-20040121681-\$ or US-20050098466-\$ or US-20050112085-\$ or US-20050113771-\$).did. or (US-5009308-\$ or US-5011019-\$ or US-5046604-\$ or US-5161686-\$ or US-5164178-\$ or US-5306487-\$ or US-5390475-\$ or US-5492675-\$ or US-5789044-\$ or US-5846696-\$). did. or (US-2066946-\$ or US-2523145-\$).did.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/12/15 12:52
S16	18	("2690415"   "2933455"   "3093546"   "3340875"   "3804094"   "3939838"   "4009684"   "4385632"   "4525410"   "4547195"   "4654039"   "4795482"   "4826497"   "4963431").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/12/15 16:09
S17	530	604/359-360.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 16:10
S18	164	S17 and (carbon)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 16:10
S19	159	S18 and (wrap) or (tissue near wrapsheet)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 16:29
S20	56	S19 and (odor or deodorize)	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 17:06
S21	0	EP348978.pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 17:07
S22	2	"0348978".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 17:07

S23	0	"ep0348978".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO	OR	ON	2005/12/15 17:07
S24	0	"0348978".pn.	EPO	OR	ON	2005/12/15 18:51
S25	35	("2418907"   "2634229"   "3340875"   "3490454"   "3691271"   "3762415"   "3794034"   "3804094"   "3856014").PN. OR ("3939838").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/12/15 18:59



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## Activated Charcoal

### Definition

**Activated charcoal** or **activated carbon** is an amorphous form of carbon. This means that it has no regular atomic structure, unlike the other forms (allotropes) of elemental carbon: diamond, graphite, fullerenes or nanotubes.

Activated charcoal differs from the familiar charcoal that is used in barbecue grills. Common charcoal contains other organic residues, is much less porous, and has a lower surface area.

Trade names for activated carbon include Norit and Ultracarbon.

### Additional Info

Charcoal is obtained by burning wood, nutshells, coconut husks, animal bones, and/or other carbonaceous (carbon-containing) materials. Charcoal becomes activated by heating it with steam to approximately 1000 °C in the absence of oxygen (O<sub>2</sub>). This treatment removes residual non-carbon elements and produces a porous internal microstructure having an extremely high surface area. A single gram of such material can have 400 to 1,200 square meters of surface area, 98% of it internal!

The chemical nature of amorphous carbon, combined with a high surface area and porosity, makes it an ideal medium for the **adsorption** and **absorption** of organic chemicals. Adsorption means that the chemical has an interaction with the surface of the material; absorption is incorporation into a host structure through pores (interstices). To avoid confusion, we can refer to the incorporated material as "sorbed".

Activated carbon can remove organic materials from gas streams or solutions. The amount of material removed depends on the capacity of the activated carbon as well as the affinity of the material for the carbon. Typical uses are to remove odors and volatile organic compounds (VOC's).

Laboratory chemists often use activated carbon to remove colored impurities from crude

organic reaction products. Typically, one dissolves the material in a solvent (if it is not already a liquid), adds activated carbon, and then filters the mixture to remove the carbon. This technique works well for colorless or lightly colored materials; in general, colored impurities tend to have molecular structures that make them bind preferentially to the charcoal.

Activated charcoals impregnated with other materials are also effective industrial and laboratory catalysts for chemical reactions. For example, vegetable oils may be hydrogenated by exposing them to a hydrogen atmosphere in the presence of a carbon-supported palladium catalyst.

## MSDS Relevance

Activated charcoal can appear in several ways on an MSDS:

1. It may be specified as a gas or vapor adsorbent in air-purifying respirators. These are commonly provided as screw-on cartridges. Keep in mind that charcoal canisters or filters have a finite capacity for organic materials and that one can generally not tell when this limit has been reached. Regularly replace filters according to the manufacturer's recommendations.
2. It may be specified as a spill adsorbent or to purify contaminated solutions.
3. It may be utilized as a solid adsorbent in air sampling and monitoring. Many OSHA air-monitoring protocols involve drawing an air sample through an activated carbon column followed by chemical analysis of the adsorbed material.
4. It is commonly given as an antidote to certain ingested poisons. Every home with small children should have a container of activated charcoal for use in accidental poisonings, but administration as an antidote should only be done after contacting a poison control center or other medical professional. Activated charcoal is good at preventing the absorption of many poisons from the gastrointestinal tract, however, it does a poor job with alcohols, hydrocarbons, cyanides, iron, boron, lithium, other metals, corrosives and organo-phosphates (certain nerve agents or pesticides).

**NEVER** attempt to use regular charcoal briquettes (the kind you buy at a store for a barbecue grill) as a substitute for activated charcoal.

## Further Reading

- o American Association of Poison Control Centers or call (800) 222-1222.
- o Activated Carbon, What Is It at Norit, a major activated carbon producer.
- o Activated carbon filtration at North Dakota State University (good info).
- o Use of Activated Charcoal for poisonings at the Illinois Emergency Medical Services for Children.

**See also:** antidote, catharsis, emetic, poison, respirator, smoke.

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Main Entry: <sup>2</sup>coat

Function: *transitive verb*

1 : to cover with a coat

2 : to cover or spread with a finishing, protecting, or enclosing layer

- coat·er *noun*

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